

Accumulation of ^4He in the groundwaters from multi-layered aquifers in the western part of the Osaka Basin, SW Japan.

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Helium in groundwater is an useful indicator for estimating groundwater age. Accumulation of He, however, still includes unsolved issues. In this study, spatial distributions of He concentrations and isotopic ratios were investigated for many groundwater samples in the Osaka Basin, SW Japan, to consider the accumulation mechanism into groundwaters for a multi-layered sedimentary basin.

Most of deep groundwater (1000-1500 m depth), which was sampled from the lowermost part of the basin, accumulates large amount of He up to 1×10^{-5} $\text{cm}^3\text{STP/gH}_2\text{O}$. By contrast, the He concentrations in shallow groundwaters are almost identical to those in air saturated water (4.5×10^{-8} $\text{cm}^3\text{STP/gH}_2\text{O}$) with nearly atmospheric $^3\text{He}/^4\text{He}$ ratio. The groundwaters from middle-depth aquifer systems (100-300 m depth) contain a little but significant amount of excess He with slightly low $^3\text{He}/^4\text{He}$ ratio.

Comparing the ^4He concentrations with other age-related isotopes such as ^{14}C and ^{36}Cl , an enhanced accumulation rate is expected for the groundwaters from the lowermost aquifer. An external He flux from deeper region is needed for this aquifer. This is supported by relatively high $^3\text{He}/^4\text{He}$ ratios in deep groundwater indicating the incorporation of mantle He component. On the other hand, the inferred groundwater accumulation rate for the middle-depth aquifer is much smaller than that for the lowermost aquifer. Absence of mantle He component implies that there is virtually no contribution of external He source. It can be explained by *in situ* produced He within aquifer and adjacent aquitards only.

From these considerations, the groundwaters basically dissolve radiogenic He only produced within the aquifer rock for upper-layer of the aquifers, because the lowermost aquifers trapped the external source from the whole crust (and upper mantle) as well as *in situ* produced radiogenic He.

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